INDOOR AIR QUALITY ASSESSMENT

Department of Revenue
436 Dwight Street (State Office Building)
Springfield, MA

Prepared by:
Massachusetts Department of Public Health
Bureau of Environmental Health
Indoor Air Quality Program
November 2016

Background

Building:	Department of Revenue (DOR)
Address:	436 Dwight Street, Springfield, MA
Assessment Requested by:	Joshua Martin, Deputy Director, Office of Facilities Management, Massachusetts DOR
Reason for Request:	Lease renewal indoor air quality (IAQ) status report
Date of Assessment:	October 27, 2016
Massachusetts Department of Public Health/Bureau of Environmental Health (MDPH/BEH) Staff Conducting Assessment:	Ruth Alfasso, Environmental Engineer/Inspector, IAQ Program
Building Description:	Four-story granite-faced building built in 1931. DOR offices occupy the third floor with one occupied suite on the fourth floor. The building has several other state office tenants.
Building Population:	Approximately 60 employees over the two floors
Windows:	Not openable

Methods

Please refer to the IAQ Manual for methods, sampling procedures, and interpretation of results (MDPH, 2015).

IAQ Testing Results

The following is a summary of indoor air testing results (Table 1).

- ***Carbon dioxide levels*** were below 800 parts per million (ppm) in all areas assessed, indicating adequate fresh air in the space.
- ***Temperature*** was within the recommended range of 70°F to 78°F in all areas assessed.
- ***Relative humidity*** was below the recommended range of 40% to 60% in all areas assessed.
- ***Carbon monoxide*** levels were non-detectable in all indoor areas assessed.

- ***Fine particulate matter (PM2.5)*** concentrations measured were below the National Ambient Air Quality Standard (NAAQS) level of 35 $\mu g/m^3$ in all areas assessed.

Ventilation

A heating, ventilating, and air conditioning (HVAC) system has several functions. First, it provides heating and, if equipped, cooling. Second, it is a source of fresh air. Finally, an HVAC system will dilute and remove normally occurring indoor environmental pollutants by not only introducing fresh air, but also filtering the airstream and ejecting stale air to the outdoors via exhaust ventilation. Even if an HVAC system is operating as designed, point sources of respiratory irritation may exist and affect symptoms in sensitive individuals. The following analysis examines and identifies components of the HVAC system and likely sources of respiratory irritant/allergen exposure due to water damage, aerosolized dust, and/or chemicals found in the indoor environment.

Fresh air is provided by air handling units (AHUs) located on the roof. Air from the AHUs is filtered, heated/cooled, and delivered to rooms via ducted supply vents (Picture 1). Air is returned/exhausted through vents in the ceiling (Picture 2).

The assessment results indicate that the ventilation system is providing adequate fresh air for the occupancy in the building. It is recommended that HVAC systems be re-balanced every five years to ensure adequate air systems function (SMACNA, 1994). It is unknown when the last time this system was balanced. However, it was reported that components of the HVAC system had recently been replaced as a part of a series of building upgrades.

Microbial/Moisture Concerns

A few water-damaged ceiling tiles were observed on the 4th floor (Picture 3). The conditions causing the leak (e.g., roof leaks) should be fixed, and the tiles should be replaced.

Plants were observed in office areas (Table 1; Pictures 4 and 5). Plants can be a source of pollen and mold, which can be respiratory irritants to some individuals. Plants should be properly maintained and equipped with drip pans to prevent water damage to porous materials. Plants should also be located away from air diffusers to prevent the aerosolization of dirt, pollen, and mold.

Small refrigerators and water dispensers were observed in carpeted areas (Pictures 6 and 7). These appliances may spill or leak and lead to carpet damage and microbial growth. It is recommended that these appliances be located in areas without carpeting or on waterproof mats. Carpet squares could also be replaced with tile in areas where water dispensers and refrigerators are located. Some of the refrigerators were crowded with items or had evidence of spills/crumbs. Refrigerators should be kept clean to prevent odors and microbial growth.

Other IAQ Evaluations

Exposure to low levels of total volatile organic compounds (TVOCs) may produce eye, nose, throat, and/or respiratory irritation in some sensitive individuals. To determine if VOCs were present, BEH/IAQ staff examined rooms for products containing VOCs. BEH/IAQ staff noted hand sanitizers, cleaners, and dry erase materials in use within the building (Picture 8; Table 1). All of these products have the potential to be irritants to the eyes, nose, throat, and respiratory system of sensitive individuals. Photocopiers were also located next to occupied cubes; when heavily used, photocopiers can emit ozone, which is a respiratory irritant, and may also emit particulates and odors.

Cooking equipment, including toasters, microwave ovens and coffee machines were located in various parts of the office space (Pictures 8 and 9). The presence of so many different pieces of cooking equipment near workstations and without direct exhaust ventilation increases the chance of food odors permeating office areas. Food areas and cooking equipment need to be kept clean to prevent odors and pests. Carpeting in these areas may trap crumbs and spills as well. Consider consolidating cooking areas into unoccupied and uncarpeted areas or protect the carpeting in these areas with a mat.

The offices were mostly carpeted. Carpets should be cleaned annually (or semi-annually in soiled/high traffic areas) in accordance with Institute of Inspection, Cleaning and Restoration Certification (IICRC) recommendations, (IICRC, 2012).

In some areas, stored materials and accumulated items make it more difficult for custodial staff to clean. Items should be stored neatly and moved periodically to allow for wet wiping and vacuuming of surfaces. In some places, workstation walls were set up against the original exterior or interior walls of the building, leaving narrow gaps. These areas can catch dirt

and debris and become a source of odors, and harborage for pests. Ensure that these areas are cleaned regularly.

Personal fans were observed in a number of areas. Fan blades to some of these units had settled dust, which can be reaerosolized when the fan is activated.

Some of the supply vents were observed to be set in ajar ceiling tiles (Picture 10). This may indicate that the tiles are not quite cut to fit around them properly, or that the plenum is pressurized. Missing and ajar tiles were observed in a few other areas as well (Picture 11). These conditions can lead to debris from the plenum space entering into occupied areas.

Conclusions/Recommendations

Based on observations at the time of assessment, the following is recommended:

1. Operate supply and exhaust ventilation in all areas during occupied periods.
2. Have the HVAC system balanced every 5 years in accordance with SMACNA recommendations (SMACNA, 1994).
3. Repair conditions leading to water-damaged ceiling tiles, and replace the tiles.
4. Keep indoor plants in good condition, avoid overwatering, and avoid placing them on porous items such as carpets or paper. Also, keep plants out of the air stream of supply vents.
5. Consider locating refrigerators and water dispensers in non-carpeted areas or place on a waterproof mat.
6. Clean refrigerator spills promptly and clean refrigerators out regularly to avoid odors and microbial growth.
7. Ensure cooking areas/equipment are kept clean to prevent odors and pests. Consider reducing the number of areas where food is stored and locating them away from occupied areas.
8. For buildings in New England, periods of low relative humidity during the winter are often unavoidable. Therefore, scrupulous cleaning practices should be adopted to minimize common indoor air contaminants whose irritant effects can be enhanced when the relative humidity is low. To control for dusts, a high efficiency particulate arrestance (HEPA) filter equipped vacuum cleaner in conjunction with wet wiping of all surfaces is

recommended. Avoid the use of feather dusters. Drinking water during the day can help ease some symptoms associated with a dry environment (throat and sinus irritations).

9. Change filters on AHUs on a regular schedule at least twice a year.
10. Consider moving photocopiers, particularly those that are heavily used, away from occupied areas.
11. Clean carpeting in accordance with IICRC recommendations (IICRC, 2012).
12. Ensure hidden areas between workstations and walls get cleaned regularly.
13. Reduce accumulated materials on flat surfaces and store in an organized manner to allow for thorough cleaning.
14. Clean the blades of personal fans periodically to avoid aerosolizing dusts.
15. Ensure missing ceiling tiles are replaced and that all tiles fit snugly into the ceiling tile system to prevent debris from the plenum from entering occupied areas.
16. Refer to resource manual and other related IAQ documents located on the MDPH's website for further building-wide evaluations and advice on maintaining public buildings. These documents are available at: http://mass.gov/dph/iaq.

References

IICRC. 2012. Institute of Inspection, Cleaning and Restoration Certification. Carpet Cleaning: FAQ. Retrieved from http://www.iicrc.org/consumers/care/carpet-cleaning.

MDPH. 2015. Massachusetts Department of Public Health. Indoor Air Quality Manual: Chapters I-III. Available at: http://www.mass.gov/eohhs/gov/departments/dph/programs/environmental-health/exposure-topics/iaq/iaq-manual/.

SMACNA. 1994. HVAC Systems Commissioning Manual. 1st ed. Sheet Metal and Air Conditioning Contractors' National Association, Inc., Chantilly, VA.

Picture 1

Vent for supply air

Picture 2

Typical exhaust vent

Picture 3

Water-damaged ceiling tiles

Picture 4

Plants on a windowsill

Picture 5

Plant on a bookshelf, note water stains

Picture 6

Water dispenser and two refrigerators on carpet

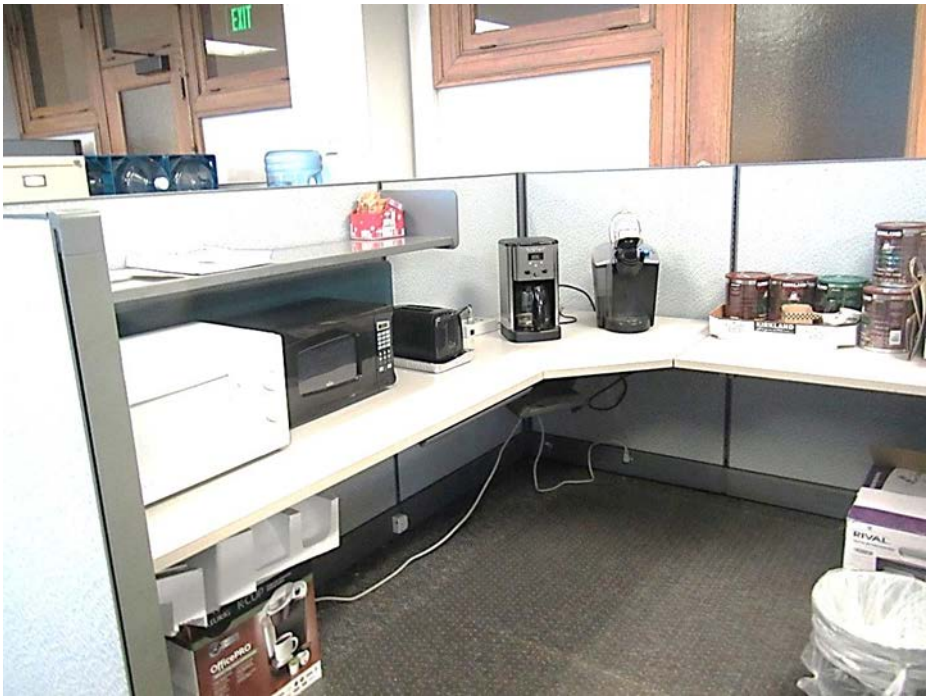
Picture 7

Water-dispenser on carpet in hard-to-reach area

Picture 8

Microwave and toaster on top of office furniture

Picture 9



Cooking equipment in office area

Picture 10

Ajar tile next to vent

Picture 11

Missing ceiling tile (on side along windows)

Location: Department of Revenue Office **Indoor Air Results**

Address: 436 Dwight Street, Springfield, MA **Date: 10/27/2016**

Table 1

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
Background	385	ND	47	30	10					Cold, cloudy, and windy
3rd floor										
Mogelinski	513	ND	72	23	4	0	N	Y	Y	HS, items
Patel	555	ND	73	23	5	0	N	Y	Y	
Kras	546	ND	74	22	4	1	N	Y	Y	WC on carpet
Slingerland	733	ND	75	22	5	1	N	Y	Y	CP, plants
Perry	543	ND	75	20	5	0	N	Y	Y	PF, CP
Tall cube	535	ND	75	19	6	1	N	Y	Y	
St. Onge	523	ND	75	20	5	1	N	Y	Y	
Storage	598	ND	75	19	6	0	N	Y	Y	Toaster

ppm = parts per million
µg/m^3 = micrograms per cubic meter
ND = non detect
AI = accumulated items
AT = ajar tile
CP = cleaning products
CT = ceiling tile
DO = door open
HS = hand sanitizer
MT = missing tile
PF = personal fan
WC = water cooler
WD = water-damaged

Comfort Guidelines

Carbon Dioxide: < 800 ppm = preferred
> 800 ppm = indicative of ventilation problems

Temperature: 70 - 78 °F
Relative Humidity: 40 - 60%

Location: Department of Revenue Office

Address: 436 Dwight Street, Springfield, MA

Indoor Air Results

Date: 10/27/2016

Table 1 (continued)

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 ($\mu g/m^3$)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
#33	578	ND	74	19	5	1	N	Y	Y	
cube next to #33	538	ND	75	20	5	1	N	Y	Y	Cut flowers
Lorenzi	538	ND	75	19	5	1	N	Y	Y	HS
Vacant cube	547	ND	74	19	5	0	N	Y	Y	WC on carpet
Dastous	527	ND	75	19	5	0	N	Y	Y	DO, food
Collier	601	ND	74	19	5	2	N	Y	Y	Food odors
Halket	600	ND	74	19	5	1	N	Y	Y	
Kawa	544	ND	74	19	5	0	N	Y	Y	CP
Cummings	493	ND	74	19	5	1	N	Y	Y	Food
Kulig	495	ND	74	19	5	2	N	Y	Y	

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								Supply	Exhaust	
Anderson	491	ND	74	19	5	2	N	Y	Y	Plants, food, CP
Bryant	572	ND	74	19	5	2	N	Y	Y	Plants, PF
Bush	628	ND	74	20	5	1	N	Y	Y	AT, CP
Thole	589	ND	75	20	6	1	N	Y	Y	Plants, AI, dusty PF
Jajko	644	ND	74	19	5	1	N	Y	Y	
Maende	560	ND	75	20	6	2	N	Y	Y	Food, coffee, plants
Mulano	531	ND	75	20	5	1	N	Y	Y	Refrigerator on carpet, WC on carpet
Iovine	617	ND	74	18	6	1	N	Y	Y	Plant
Merrill	543	ND	74	19	6	2	N	Y	Y	Plants, items
Nicklaw	532	ND	74	19	6	1	N	Y	Y	Plant

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Anzalotti	431	ND	73	19	6	0	N	Y	Y	Plant
Nowicki	461	ND	73	19	6	0	N	Y	Y	MT above window
Dietrich	537	ND	73	20	6	1	N	Y	Y	WC and fridge on carpet
Burns	468	ND	73	20	6	1	N	Y	Y	Plants
4th floor suite										
Reception	741	ND	73	21	6	0	N	Y	Y	
Conference	700	ND	73	21	6	6	N	Y	Y	WD CT
Andre	600	ND	72	20	6	0	N	Y	Y	
William		ND	72	23	6	1	N	Y	Y	Papers/items
Wayne	565	ND	72	19	6	0	N	Y	Y	

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								Supply	Exhaust	
Bliss	561	ND	72	20	6	1	N	Y	Y	DO, coffee
Barbieri	558	ND	71	20	7	0	N	Y	Y	Items on floor
Tod	451	ND	71	20	6	1	N	Y	Y	PF
Storage/food	507	ND	71	20	8	0	N	Y	Y	WC on carpet, microwave, toaster
Unused 4th floor space next to occupied suite	411	ND	71	20	6	0	N	Y	Y	MT

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